REMARKS/ARGUMENTS

Amendments were made to the specification to limit the number of words in the Abstract to 150 words. No new matter has been added by any of the amendments to the specification.

Claims 1-25 are pending in the present application. Claims 1, 3-6, 8-11, 13, 15-18, 20-23, and 25 are amended. Support for the amendments to the claims is located at least on page 4, lines 3-19; on page 10, line 18, through page 11, line 8; on page 21, lines 11-23; on page 22, lines 13-27; on page 24, line 12, through page 25, line 21; and in Figures 5-7. Reconsideration of the claims is respectfully requested.

I. 35 U.S.C. § 112, Second Paragraph

The Examiner has rejected claims 11 and 23 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter, which applicants regard as the invention. This rejection is respectfully traversed.

The Examiner states:

> Claims 11and 23 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 21 72.01. The omitted elements are the steps taken to compose the "delta" value. It is a difference between an adjusted data model and an original data model, but the difference in what regard is unclear. Since there are numerous points where a value can be taken it is impossible to know what the applicant intended.
>
> Since claim 11 is unclear, claims 10, 22, 11, 23, 12, and 24 will not undergo a prior art search. Doing so would be unfair to the applicant as the examiner might use incorrect art against the claims.

Office Action dated December 27, 2007, page 2.

Claims 10, 11, 22, and 23 are amended to provide clarification as requested by the Examiner. Therefore, the rejection of claims 11 and 23 under 35 U.S.C. § 112, second paragraph has been overcome.

II. 35 U.S.C. § 102, Anticipation

The Examiner has rejected claims 1-5, 7-9, 13-17, 19-21, and 25 under 35 U.S.C. § 102(e) as being anticipated by *Selby et al.* (U.S. Patent Application No. 2004/0039548), hereinafter referred to as *Selby*. This rejection is respectfully traversed.

The Examiner states:

> **Regarding Claims 1, 13, 25.**
>
> Selby teaches a method, in a data processing system, for detecting fraud, the method comprising:
>
> receiving a set of historical data; (See Fig 1 Paragraph 21)
>
> identifying a plurality of control points in the historical data; (See Paragraph 22)

providing at least one data model based on the plurality of control points; (Paragraph 23)

receiving a set of updated data; (Paragraph 21)

identifying one or more new control points based on the updated data; (Paragraph 22)

adjusting the at least one data model based on the one or more new control points; (Paragraph 23)

verifying a transaction based on the adjusted data model. (Paragraph 23)

Regarding Claim 2, 14.

Shelby further teaches the historical data includes at least one of demographic data, psychographic data, transactional data, and environmental data. (See Paragraph 16)

Regarding Claim 3, 15.

Shelby further teaches identifying a plurality of control points includes:

identifying a plurality of outliers in a distribution of the historical data; (Paragraph 23)

validating the plurality of outliers; (Paragraph 23)

categorizing the plurality of outliers as valid or invalid. (Paragraph 23)

Regarding Claim 4, 16.

Shelby further teaches the control points are valid outliers. (Paragraph 23)

Regarding Claim 5, 17.

Shelby further teaches the control points are invalid outliers. (Paragraph 23)

Regarding Claim 7, 19.

Shelby further teaches the updated data includes at least one of demographic data, psychographic data, transactional data, and environmental data. (See Paragraph 16)

Regarding Claim 8, 20.

Shelby further teaches adjusting the data model includes adding the one or more new control points to the data model. (Paragraph 22)

Regarding Claim 9, 21.

Shelby further teaches adjusting the data model includes changing one or more of the plurality of control points to the one or more new control points in the data model. (See Paragraph 16)

Office Action dated December 27, 2007, pages 3-5.

As amended, claim 1, which is representative of the other rejected independent claim 13 and 25 with regard to similarly recited subject matter, reads as follows:

1. A method, in a data processing system, for detecting fraud, the method comprising:

receiving a set of historical data;

identifying a plurality of control points in the historical data;

building at least one data model based on the plurality of control points;

receiving a set of updated data;

identifying one or more new control points based on the updated data;

adjusting the at least one data model to form an adjusted data model, within the at least one data model, based on the one or more new control points, wherein the at least one data model is refined for a plurality of iterations; and

verifying a transaction based on the adjusted data model. (emphasis added)

A prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. *In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). All limitations of the claimed invention must be considered when determining patentability. *In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031, 1034 (Fed. Cir. 1994). Anticipation focuses on whether a claim reads on the product or process a prior art reference discloses, not on what the reference broadly teaches. *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983). Applicant respectfully submits that *Selby* does not identically show every element of the claimed invention arranged as they are in the claims. Specifically, *Selby* does not teach or suggest each and every feature as recited in amended independent claims 1, 13, and 25.

Selby is directed to a method, system, and computer program product for outlier detection. In *Selby*, a random sampling of a subset of a data population is taken and the sampled data is used to build a predictive model using a cubic or multi-quadric radial basis function, and then "scores" (i.e., predictions) are generated for each data point in the entire data population. This process is repeated on additional random sample subsets of the same data population. After a predetermined number of random sample subsets have been modeled and scores for all data points in the population are generated for each of the models, the average score and variation for each predicted data point is calculated. The data points are subjected to rank ordering by their variance, thereby allowing those data points having a high variance to be identified as outliers. By identifying them as outliers, these data points are "flagged" for investigation, thereby simplifying the ability to determine if the data points and the variables with which they are associated should be included in the model or removed from consideration for a particular model and/or making it easier to identify data points that identify a particular activity (e.g., fraud) but which might otherwise go unnoticed in a large body of multi-dimensional data. (See *Selby*, page 2, paragraph [0016].) *Selby* does not teach or suggest "adjusting the at least one data model to form an adjusted data model, within the at least one data model, based on the one or more new control points, wherein the at least one data model is refined for a plurality of iterations," as recited in independent claims 1, 13, and 25. To the contrary, *Selby* teaches building multiple new models with different sampling subsets and applying each of the new models to the entire data population to calculate predictive values for each of the data points in the entire data population. All of the predictive values for a data point are used to calculate an average predictive value and a corresponding variance of the average predictive value. Variances that exceed a predetermined outlier threshold are identified as candidates for investigation as outliers.

With respect to the rejection of independent claims 1, 13, and 25, the Office Action refers to the following portions of *Selby*:

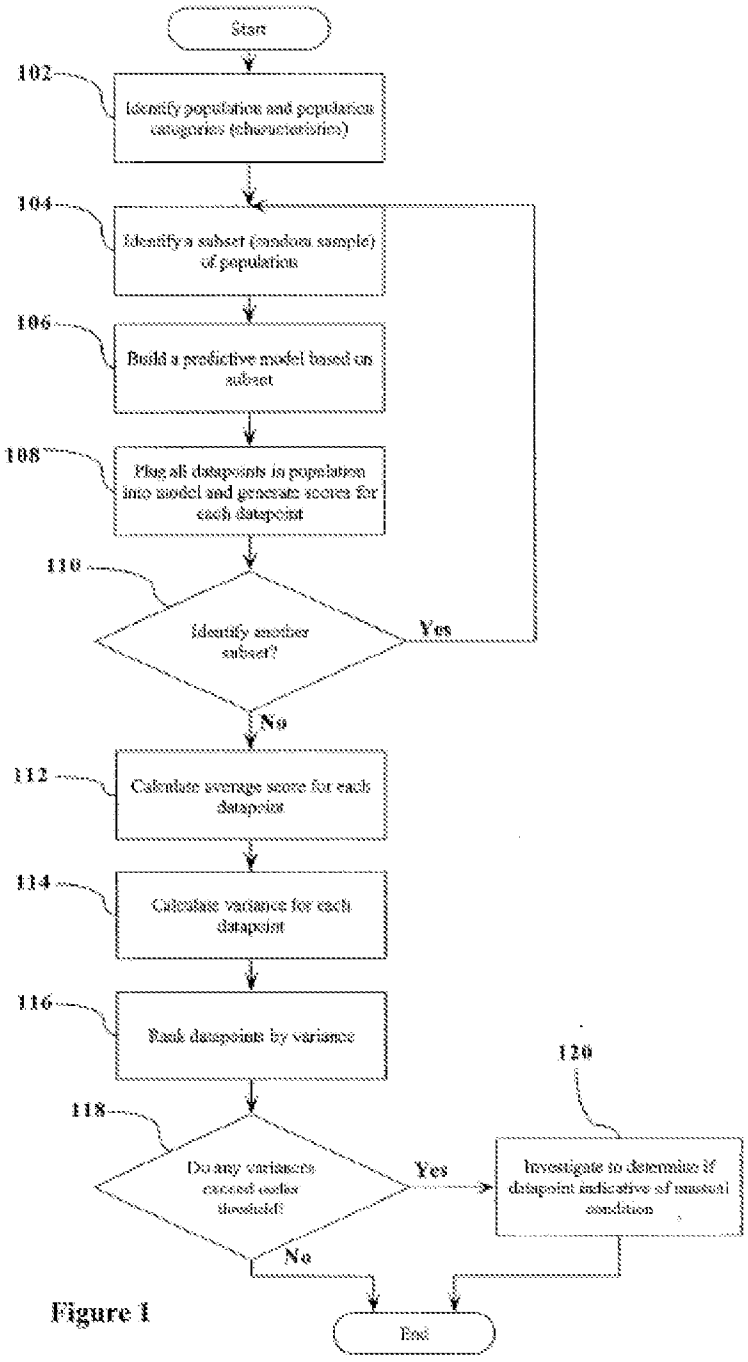

Figure 1

Selby, Figure 1.

> [0021] **FIG. 1** illustrates an example of the steps of the present invention. In accordance with the present invention, bootstrapping is utilized to build multiple models from subsets of the population, and then the models are applied to all of the data points in the population. At **step 102**, a large population of data points related to a large number (e.g.,

>3) of variables is identified and then, at **step 104**, a random sample of a subset of the data points is selected. For each subset so selected, a predictive model is built using a cubic or multi-quadric radial basis function (**step 106**). All of the data points within the entire population are then plugged into the model to generate scores (predicted values) for each data point in the complete data population (**step 108**). At **step 110**, a determination is made as to whether or not additional subsets of the entire population are to be selected and modeled. If yes, the process proceeds back to **step 104**. This process continues until a predetermined number of subsets has been modeled. This process is repeated with more accurate results being achieved as the number of repetitions increases.

[0022] Once the desired number of repetitions have been completed, the average score (**step 112**) and variation (**step 114**) for each data point is calculated. The data points are then ranked according to their variance (**step 116**). By rank ordering the data points by their variance, those points that have high variances (e.g., exceed a predetermined "outlier threshold") are identified as candidates for investigation as outliers (**steps 118** and **120**). Using this technique, a measure of confidence in the predictive value for each data point is also obtained.

[0023] The above-described method is able to highlight outliers because, in a sparsely populated region of the multi-dimensional (i.e., multi-variable) space, an instance where the outcome is unusual, as compared with the other instances in the region, causes the model fit to differ significantly, depending on whether the point is included in the sample or not. In a data set having a large number (e.g., >3) of variables, the impact of these outliers is difficult to "see", and thus they cannot be easily investigated. By breaking down the modeling into subsets of the data, applying the models to the entire data set, and then ranking the data points according to their variance, the outliers are more visible, and thus they can be located and investigated to determine whether they are real, incorrect, irrelevant to the analysis, or indicative of something undesirable happening, e.g., fraud.

Selby, page 2, paragraphs [0021]-[0023].

In these portions of *Selby*, multiple new predictive models are built from different subsets of the population and then each of the new predictive models are applied to all of the data points in the population. Each data point in a subset is applied to a standard cubic or multi-quadratic radial basis function. By fitting the function to the data points of the subset, an equation representing the predictive model is obtained. A curve, generated by plugging the data points of the subset into the equation, provides the predictive model. Each subset of data points provides a different equation and a different model. All of the data points within the entire population are plugged into each of the predictive models to generate predicted values for each data point in the entire population. After a predetermined quantity of subsets has been modeled, an average predictive value and a corresponding variance of the average predictive value are calculated for each data point in the entire population. Variances that exceed a predetermined outlier threshold are identified as candidates for investigation as outliers. *Selby* does not teach or suggest "adjusting the at least one data model to form an adjusted data model, within the at least

one data model, based on the one or more new control points, wherein the at least one data model is refined for a plurality of iterations," as recited in independent claims 1, 13, and 25.

In view of the above, Applicant respectfully submits that *Selby* does not teach each and every feature of independent claims 1, 13, and 25, as is required under 35 U.S.C § 102(e). In addition, *Selby* does not teach each and every feature of dependent claims 2-12 and 14-24 at least by virtue of their dependency on claims 1 and 13, respectively. Accordingly, Applicant respectfully requests withdrawal of the rejection of claims 1-5, 7-9, 13-17, 19-21, and 25 under 35 U.S.C § 102(e).

Furthermore, *Selby* does not teach, suggest, or give any incentive to make the needed changes to reach the presently claimed invention. *Selby* actually teaches away from the presently claimed invention because it teaches using a non-linear model (e.g. quadratic, cubic, etc.) and a global fitting process to identify outliers as opposed to generating a fence or data model that passes through the plurality of control points (e.g. linear) and using the fence to verify a transaction as in the presently claimed invention. In the present invention, the plurality of control points are identified by analyzing data using statistical modeling, outlier analysis, and data mining algorithms. Data points within the fence represent acceptable behavior and data points outside the fence represent unacceptable behavior. Absent the examiner pointing out some teaching or incentive to implement *Selby* and generating a linear fence that passes through the plurality of control points and using the fence to verify a transaction, one of ordinary skill in the art would not be led to modify *Selby* to reach the present invention when the reference is examined as a whole. Absent some teaching, suggestion, or incentive to modify *Selby* in this manner, the presently claimed invention can be reached only through an improper use of hindsight using the applicant's disclosure as a template to make the necessary changes to reach the claimed invention.

In addition to being dependent on their respective independent claims, claims 2-5, 7-12, 14-17, and 19-24 also distinguish over the *Selby* reference based on the specific features recited therein. With respect to amended claims 3 and 15, *Selby* does not teach or suggest "identifying a plurality of outliers in a distribution of the historical data by analyzing the historical data using statistical modeling, outlier analysis, and data mining algorithms." To the contrary, *Selby* teaches using a cubic or quadratic equation for each of the data models to generate predictive values. Each subset of data points provides a different data model and a different equation. The predictive values of a data point for each of the different data models are averaged and a corresponding variance of the average predictive value is calculated. A variance that exceeds a predetermined outlier threshold is identified as an outlier.

Additionally, *Selby* does not teach or suggest that "the plurality of control points are valid outliers," as recited in claims 4 and 16, or that "the plurality of control points are invalid outliers," as recited in claims 5 and 17. *Selby* only teaches plotting the subset of data points. *Selby's* predictive model

may not include any outliers or data points of the subset since the predictive model is generated using the calculated predictive values of the subset of data points using a cubic or quadratic equation.

With respect to amended claims 8 and 20, *Selby* does not teach or suggest that the adjusting step includes "adding the one or more new control points to the at least one data model; and generating a fence that passes through the plurality of control points and the one or more new control points, and wherein data points within the fence represent acceptable behavior and data points outside the fence represent unacceptable behavior." Similarly, *Selby* does not teach or suggest that the adjusting step includes "changing one or more of the plurality of control points to the one or more new control points in the at least one data model; and generating a fence that passes through the plurality of control points, and wherein data points within the fence represent acceptable behavior and data points outside the fence represent unacceptable behavior," as recited in amended claims 9 and 21. To the contrary, *Selby* teaches away from a linear model and teaches generating a new predictive model with each different subset of randomly selected data points from the entire population.

In addition with respect to amended claims 10-12 and 22-24, *Selby* does not teach or suggest determining whether the adjusted model within the at least one data model reached a steady state and either converting the adjusted data model to a static model if the steady state has been reached or refining the at least one data model if the steady state has not been reached. Claims 10-12 and 22-24 did not undergo a prior art search so that incorrect art would not be sighted against the claims. Applicant thanks the Examiner for this consideration.

III. 35 U.S.C. § 103, Obviousness

The Examiner has rejected claims 6 and 18 under 35 U.S.C. § 103(a) as being unpatentable over *Selby* in view of *Official Notice*. This rejection is respectfully traversed.

The Examiner states:

> **Regarding Claim 6, 18.**
>
> Shelby further teaches the at least one data model includes a fence that passes through the plurality of control points, wherein data points within the fence represent acceptable behavior and data points outside the fence represent unacceptable behavior. (See Fig 2, Paragraph 26) Examiner notes that the fence, created in Shelby, indicates the averages of all points, which passes through the various control points. Official Notice is taken that since the invention in Shelby is capable of graphing, it would be obvious for the system to easily be customized to connect the furthest valid outliers to show a threshold. Line plotting has been around for a extremely long time.
>
> There is motivation to combine Shelby with official notice because by showing the plotted lines allows for easier recognition of fraudulent, increasing the likelihood that they are caught, increasing the chances that the company will start to lose less money do to fraud.

Office Action dated December 27, 2007, pages 5-6.

Selby does not teach each and every feature of independent claims 1 and 13. Therefore, Applicant respectfully submits that *Selby* does not teach each and every feature of claims 6 and 18 at least by virtue of their dependency on claims 1 and 13, respectively. In addition, *Official Notice* does not provide for the deficiencies of *Selby* with respect to independent claims 1 and 13. Thus, Applicant respectfully submits that the combination of *Selby* with *Official Notice* does not teach or suggest the features of claims 6 and 18 at least by virtue of their dependency on claims 1 and 13, respectively. Therefore, any alleged combination of *Selby* with *Official Notice* does not establish a *prima facie* case of obviousness based on the prior art. Accordingly, Applicant respectfully requests withdrawal of the rejection of claims 6 and 18 under 35 U.S.C § 103(a).

In addition to being dependent on their respective independent claims, claims 6 and 18 also distinguish over the *Selby* reference in view of *Official Notice* based on the specific features recited therein. Applicant respectfully disagrees that it would be obvious to customize *Selby* to connect the furthest valid outliers to show a threshold since *Selby* is capable of graphing. To the contrary, *Selby* teaches using a non-linear model (see *Selby*, paragraph [0031]). It is not obvious to generate a fence that passes through a plurality of control points. In the present invention, the plurality of control points may be a plurality of valid outliers or the plurality of control points may be a plurality of invalid outliers. Applicant respectfully submits that *Selby* in view of *Official Notice* does not teach or suggest that "building the at least one data model includes generating a fence that passes through the plurality of control points, and wherein data points within the fence represent acceptable behavior and data points outside the fence represent unacceptable behavior," as recited in claims 6 and 18.

IV. Conclusion

It is respectfully urged that the subject application is patentable over *Selby* and is now in condition for allowance.

The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

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Respectfully submitted,

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